

CLAIMS

1. A current supply circuit (100) providing an output current corresponding to digital data (D0 - D5) of n bits (n is an integer not less than 2), comprising:

5 a current output node (DL) electrically connected with a first power supply node (11) via a current driving device (23) during current supply;

a current control circuit (110) provided between a second power supply node (12) and said current output node and receiving said digital data for controlling, corresponding to said digital data, an amount of current on a current path established including said current output node between said first and second power supply nodes during said current supply; and

10 a voltage regulating circuit (140, 150) receiving said digital data for forcing, after said current supply starts, a change in voltage on said current output node based on said digital data.

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2. The current supply circuit according to claim 1, wherein said current driving device includes a field effect transistor (23) having a source and a drain electrically connected with said first power supply node (11) and said current output node (DL), respectively, and

20 the gate and drain of said field effect transistor are electrically connected during said current supply.

3. The current supply circuit according to claim 1, wherein, during said current supply, the voltage on said current output node (DL) settles to a steady voltage (V_{st}) corresponding to a level of said output current depending on characteristics of said current driving device (23), and

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said voltage regulating circuit (140, 150) exchanges electric charge with said current output node (DL) to move the voltage on said current output node closer to said

steady voltage depending on said digital data (D0 - D5).

4. The current supply circuit according to claim 1, wherein said voltage regulating circuit (140, 150) includes:

5 a precharge circuit (140) precharging, prior to supply of said output current, said current output node (DL) to a predetermined voltage (V_{bf}); and

a precharge regulating circuit (150) exchanging, from initiation of said current supply onward, electric charge corresponding to said digital data (D0 - D5) with said current output node.

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5. The current supply circuit according to claim 4, wherein said precharge regulating circuit (150) includes n regulating units provided corresponding to the respective n bits (D0 - D5) of said digital data, and

said n regulating units include:

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respective n capacitors (C0 - C5) charged by respective first to n-th voltages (V0 - V5) prior to the supply of said output current; and

respective n switching devices (170 - 175) provided between said respective n capacitors and said current output node (DL), and

20 each of said n switches turns on or off depending on one corresponding bit of said digital data during said current supply.

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6. The current supply circuit according to claim 5, wherein, during said current supply, the voltage on said current output node (DL) settles to a constant voltage (V_{st}) corresponding to a level of said output current depending on characteristics of said current driving device (23), and

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said predetermined voltage (V_{bf}), said first to n-th voltages, (V0 - V5) and capacitances (C0 - C5) of said n capacitors are designed, for each of at least one of the combinations of the n bits of said digital data, based on a conservation of charge that

reflects said constant voltage between before and after at least one of said n switching devices (170 - 175), corresponding to said n bits, is turned on.

7. The current supply circuit according to claim 1, wherein said current control circuit (110) includes n constant-current supplies (120 - 125) provided corresponding to the respective n bits (D0 - D5) of said digital data and connected in parallel to said current output node (DL), and

said n constant-current supplies generate, corresponding to said respective n bits, first to n-th currents (I1, I2, I4, I8, I32) between said second power supply node (12) and said current output node.

8. The current supply circuit according to claim 7, wherein said first to n-th currents (I1, I2, I4, I8, I32) are set in gradations in a power of 2 corresponding to a predetermined weighing of the n bits (D0 - D5) of said digital data.

9. A current supply circuit (100#) providing an output current corresponding to digital data (D0 - D5) of n bits (n is an integer not less than 2), comprising:

a current output node (DL) electrically connected to a first power supply node (11) via a current driving device (23) during current supply;

a current control circuit (110) provided between a second power supply node (12) and said current output node and receiving said digital data for controlling, corresponding to said digital data, an amount of current on a current path established including said current data line between said first and second power supply nodes during said current supply; and

a voltage regulating circuit (140, 150) receiving said digital data for moving, prior to said current supply, a voltage on said current output node closer to a voltage corresponding to said digital data.

10. The current supply circuit according to claim 9, wherein, during said current supply, the voltage on said current output node (DL) settles to a steady voltage (V_{st}) corresponding to a level of said output current depending on characteristics of said current driving device (23), and

5 said voltage regulating circuit (140, 150) includes:

 a precharge circuit (140) precharging, during a first period ($t_0 - t_a$), said current output node to a predetermined voltage (V_{bf}); and

 a precharge regulating circuit exchanging, during a second period ($t_a - t_1$) following said first period, electric charge corresponding to said digital data (D0 - D5) with said current output node to move the voltage on said current output node (DL) closer to said steady voltage.

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11. A display device (10) performing gray-scale display corresponding to image data (D0 - D5) of n bits (n is an integer not less than 2), comprising:

15 a current supply circuit (100) for supplying a display current corresponding to said image data;

 a plurality of pixel circuits (20) each including a current-driven light-emitting device (21) providing a brightness corresponding to a supplied current and a pixel driving circuit (22) for supplying said current-driven light-emitting device with a current corresponding to said display current; and

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 a current data line (DL) for conveying said display current, which is provided by said current supply circuit, to said plurality of pixel circuits,

 wherein said pixel driving circuit has a current driving device (23) connected between said current data line and a first power supply node (11) during a predetermined period in which said display current is conveyed thereto; and supplies said current-driven light-emitting device with a current corresponding to said display current conveyed during the predetermined period, and

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 said current supply circuit includes:

a current control circuit (110) provided between a second power supply node (12) and said current data line and receiving said image data for controlling, corresponding to said image data, an amount of current on a current path established including said current data line between said first and second power supply nodes during supply of said display current; and

a voltage regulating circuit (140, 150) receiving said image data for forcing, after supply of said display current starts, a change in voltage on said current data line based on said image data.

12. The display device according to claim 11, wherein said current control circuit (110) includes n constant-current supplies (120 - 125) provided corresponding to the respective n bits (D0 - D5) of said image data and connected in parallel to said current data line, and

said n constant-current supplies generate first to n-th currents (I1, I2, I4, I8, I16, I32) on said current data line based on said respective n bits.

13. The display device according to claim 11, wherein, during the supply of said display current, the voltage on said current data line (DL) settles to a steady voltage (Vst) corresponding to a level of said display current depending on characteristics of said current driving device (23), and

said voltage regulating circuit (140, 150) includes:

a precharge circuit (140) precharging, prior to the supply of said display current, said current data line to a predetermined voltage (Vbf); and

a precharge regulating circuit (150) exchanging, from initiation of the supply of said display current onward, electric charge corresponding to said image data with said current data line to move the voltage on said current data line closer to said steady current.

14. The display device according to claim 13, wherein said precharge regulating circuit (150) includes n precharge regulating units provided corresponding to the respective n bits (D0 - D5) of said image data, and

said n precharge regulating units include:

5 respective n capacitors (C0 - C5) charged by respective first to n-th voltages (V0 - V5) prior to the supply of said display current; and

 respective n switching devices (170 - 175) provided between said respective n capacitors and said current data line (DL), and

10 each of said n switches turns on or off depending on one corresponding bit of said image data during the supply of said display current.